A REVIEW OF F. MARTIN BROWN'S RESEARCH ON THE FLORISSANT FM., FLORISSANT FOSSIL BEDS NATIONAL MONUMENT, FLORISSANT, COLORADO

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Dr. Brown first came to the Florissant area in 1933. His work on the paleoentomology of the Florissant Formation continued until the late 1980's. During his career, he was a research associate with the University of Colorado Museum, The American Museum of Natural History, and others. Brown's primary contribution to the paleontology of the Florissant area consisted of locating, assembling, and cataloging the original descriptions and plates of over 1200 species of fossil insects from the Florissant Formation. From 1976 to 1986, Brown published six papers of his own on the fossil insects. In 1986, Brown published a review and taxonomic key to the fossil tsetse flies that occur in the Florissant Formation. The tsetse flies of the Florissant Formation represent the only reported occurrence of tsetse flies in the fossil record. The tsetse flies are also significant because they are climatically restricted. According to Brown, modern tsetse flies are only able to maintain breeding populations when temperatures range from 64 to 86 degrees F (18 to 30 degrees C). Therefore, the occurrence of tsetse flies in the Florissant Formation can help us in our reconstruction of the late Eocene paleoclimate. Today, Dr. Brown is no longer actively doing research, he still maintains his interest in the geology and paleontology of the Florissant area.

STRATIGRAPHIC RESEARCH ON THE FLORISSANT "LAKE BEDS" AT FLORISSANT FOSSIL BEDS NATIONAL MONUMENT, COLORADO

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The University of Colorado Museum has a long history of paleontologic research on the Florissant "Lake Beds", starting with the work of T.D.A. Cockerell around the turn of the century. In the summer of 1992, a field crew sponsored by the Museum studied the stratigraphy, sedimentology, and vertebrate paleontology of Florissant Fossil Beds National Monument. As a result of this work, ten detailed stratigraphic sections, a surficial geologic map of the Monument, and a detailed map of the "Petrified Forest" area was compiled. Two previously unknown fossil mammal localities were discovered, which help constrain the biostratigraphic relations of the formation with the contemporaneous White River Group of Badlands National Park.

The Florissant "Lake Beds" include a combination of fluvial, lacustrine, and proximal volcanigenic deposits. The lowest exposed rocks in the Monument are tuffaceous mudstones and rare arkosic sandstones and conglomerates that were deposited in an ancient valley cut into Precambrian granite. The fossil redwood stumps occur in these lower rocks, as do the bones of titanotheres, rhinoceros, oreodonts, horses and small artiodactyls. The mammal fauna indicates a latest Eocene age (Chadronian Land Mammal Age). These fluvial rocks are covered by a tuffaceous sandy mudstone representing a volcanic mudflow which buried the stumps. The first widespread lacustrine shales occur above this mudflow deposit, and are the shales that include the historic insect and leaf quarries. Other invertebrates, such as mollusks and ostracodes, are rare in these lower shales. These shales are capped by a thick, poorly bedded, mud-rich, volcaniclastic conglomerate that represents a volcanic debris flow that entered the lake. The conglomerate is thickest in the axis of the paleovalley, and is overlain on the west and north sides of the Monument by lacustrine shales. These upper lacustrine shales contain leaves and insects as well as locally abundant ostracodes and sphaeriid clams. The abundance of invertebrates suggest a change in lake chemistry after the deposition of the volcaniclastic gravels. The lake was gradually filled by pumiceous detritus, with stream-deposited, crossbedded pumice conglomerates capping the formation. The region was tilted to the west-northwest after deposition, and minor folding occurred locally. The modern exposures of the formation strongly reflects the original form of the dendritic paleovalley, with little post-depositional modification by faulting or intense folding.

TECTONIC SIGNIFICANCE OF PALEOBOTANICALLY ESTIMATED CLIMATE AND ALTITUDE OF THE LATE EOCENE SURFACE, COLORADO

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Erosion beveled the Laramide Front Range uplift in Colorado to a surface of low relief by the end of the Eocene. This study uses J. S. Wolfe's new multivariate climate analysis techniques to determine the paleoelevation of this regional surface by examining the overlying 35 Ma Florissant flora. A multiple regression model explaining 93.3% of the variance in mean annual temperature was developed using Wolfe's dataset of 31 leaf physiognomic character states for 86 modern vegetation sites. These character states were scored on 29 species collected from one facies of the Florissant Lake Beds. The paleotemperature estimate of mean annual temperature (10.7 $\pm$ 1.5 degrees C) derived from these data, when combined with sea-level temperature and terrestrial lapse rate, implies a late Eocene paleoelevation of 2.4-2.7 km. Pliocene uplift is thus not required to explain the present elevation of 2.5 km. It is unclear when and why the southern Rocky Mountains achieved this elevation. Magmatic crustal thickening can explain the late Eocene high elevation of the southern Rockies, but neither this mechanism nor compressive thickening explains why the Great Plains, which are tied to the Florissant elevation by the Wall Mountain Tuff, were also high. This paleoelevation estimate indicates that regional surfaces of planation could be formed at high elevation in the Eocene, probably because of

peculiarities of the Eocene climate.

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